

Envision X14 C-PHYSM /D-PHYSM Analyzer/Generator for CSI-2[®] and DSI-2[®]



Analyzer Key Features

- Deep protocol capture - Analyze all CSI and DSI packet types and data formats, command and video modes, high speed and low power read and write modes, and DCS (for DSI) supported
- Complex event-based capture triggering for captures - Detailed protocol checking – PHY-level and protocol level events including low-power, high speed bursts and read/writes
- Display Stream Compression (DSC) – Decode incoming DSC encrypted content from a DSI-2 host including parsing the Picture Parameter Set metadata parameters
- Debug and analysis statistics for received data and errors including CRC, ECC, Start of Transmission and End of Transmission, etc.
- Solder-down probe system for analyzing development boards for D-Phy/C-Phy and for CSI-2/DSI-2
- External Trigger In/Out - Trigger external equipment based on packet structures or event; trigger a capture from an event on an external device
- Conformance Test Suite for CSI-2 and DSI-2 will evaluate your device against specifications

Teledyne LeCroy's Envision X14 Analyzer and Generator offers comprehensive support for MIPI C-PHY/D-PHY and CSI-2 and DSI-2 specifications.

A highly configurable single-box system, the Envision X14 is the ideal choice for any camera and display testing and validation needs.

Envision X14 Analyzer

The Envision X14 Analyzer provides deep analysis for MIPI camera and display protocols over C-PHY and D-PHY layers. The X14 Analyzer can be positioned either as an endpoint to test a CSI-2 or DSI-2 stream or tapped in between a CSI-2 or DSI-2 device and host for passive monitoring and analysis. The Envision X14 ensures fast Time-to-Insight through its rich set of innovative features for debug analysis and identifying and resolving elusive protocol errors.

The Envision X14 Analyzer will offer an integrated MIPI Conformance Test Specification (CTS) suite for both CSI-2 and DSI-2. This CTS suite will provide checks protocol conformance across

all camera and display modes, packet types, and video formats, including high speed and low-power modes.

Envision X14 Generator (Exerciser)

Teledyne LeCroy's Envision X14 Video Generator is a versatile and flexible tool for MIPI camera and display protocols. Like the Envision X14 Analyzer, the Exerciser offers a rich suite of innovative features for generating DSI-2 and CSI-2 packets, frames and images. The Envision X14 Video Generator can be configured to generate images at various resolutions, color modes, sampling rates and frame timings.



Flexible Hardware System

The Envision X14 system features standard SMP connectors that support C-PHY or D-PHY signals to provide high fidelity capture of traffic from all active lanes simultaneously. Concurrent recording of PHY-level and protocol-level events allows viewing of protocol activity to help characterize and debug interface traffic. The system includes 16GB of recording memory plus a Gigabit Ethernet link for uploading recorded traffic on the instrument or to an optional host PC.

The Envision X14 Analyzer offers a state-of-the-art protocol-processing core that incorporates a real-time recording engine and configurable tools to selectively monitor and record MIPI CSI and DSI traffic. Field upgradeable firmware allows the Transaction Processor to evolve and support new features or future changes to the MIPI CSI and DSI specifications.

The built-in triggering provides unprecedented flexibility with every packet type and error counts, including combinations, configurable as a trigger event. The Envision X14 hardware supports external triggering.

The system can be easily configured and upgraded through a flexible software options scheme, to fit your needs and allow you to extend to new use cases.

Analysis Software

The Envision X14 utilizes a software application (Video Protocol Suite) to control the instrument and view current status. The Envision X14 can be controlled through the CSI/DSI Protocol Suite software application hosted on a remote computer. The software can be used for viewing traces taken by other engineers for effective collaboration.

Emulation Mode Test Configurations

CSI-2 Test Configuration – Host Emulation Mode

In CSI host emulation mode, the X14 Analyzer acts as a MIPI Host connected to a camera or image sensor device under test (DUT) that provides the MIPI device interface.



DSI-2 Test Configuration – Device Emulation Mode

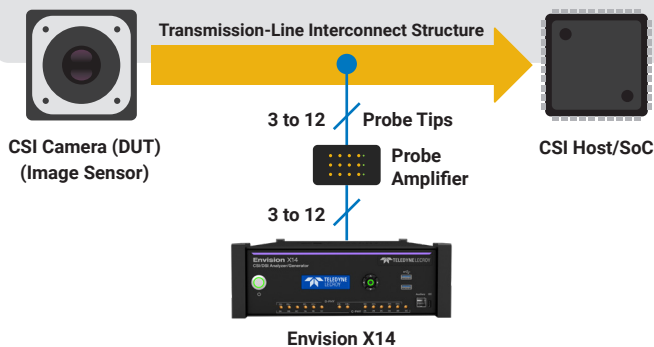
In DSI device emulation mode, the X14 Analyzer acts as a MIPI Display device connected to an SoC device under test (DUT) that provides the MIPI Host interface.



Passive Probe Mode Test Configurations

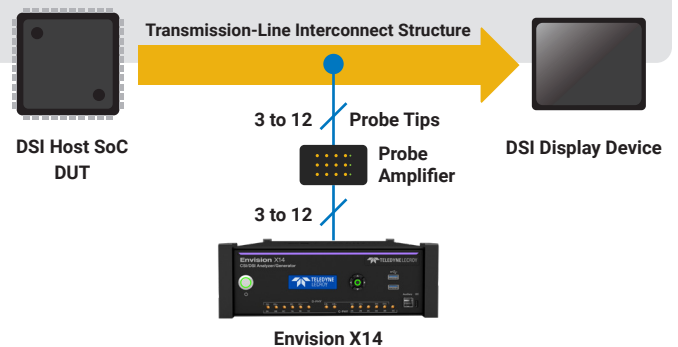
CSI-2 Test Configuration – Passive Probing Mode

In the CSI passive probing mode, the X14 Analyzer is positioned as a passive tap between a CSI host SoC and a CSI camera to sniff traffic. The Envision X14 passively monitors the protocol of High Speed (HS), Alternate Low Power (ALP), and Low Power (LP) C/D-PHY signals flowing between the CSI host and CSI camera endpoints over the Transmission Line Interconnect Structure connecting the two.



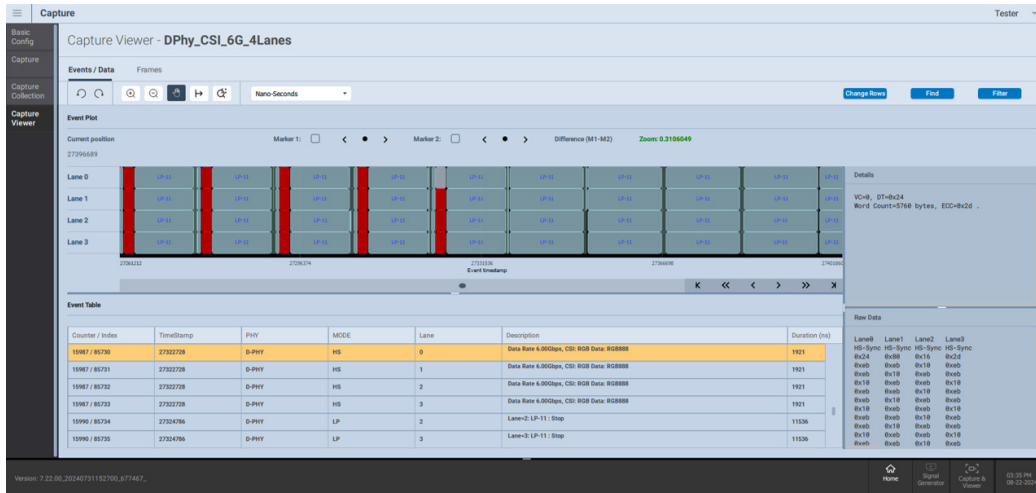
DSI-2 Test Configuration – Passive Probing Mode

In the DSI passive probing mode, the X14 Analyzer is positioned as a passive tap between a DSI host SoC and a DSI display device to sniff traffic. The Envision X14 passively monitors the protocol of High Speed (HS), Alternate Low Power (ALP), and Low Power (LP) C/D-PHY signals flowing between the DSI host SoC and DSI display endpoints over the Transmission Line Interconnect Structure connecting the two.

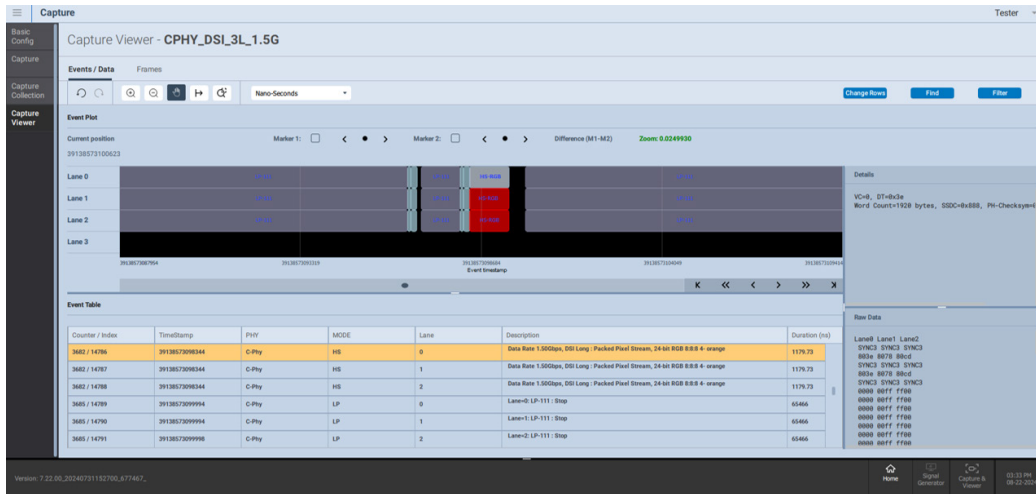


Envision X14 CSI/DSI Protocol Suite

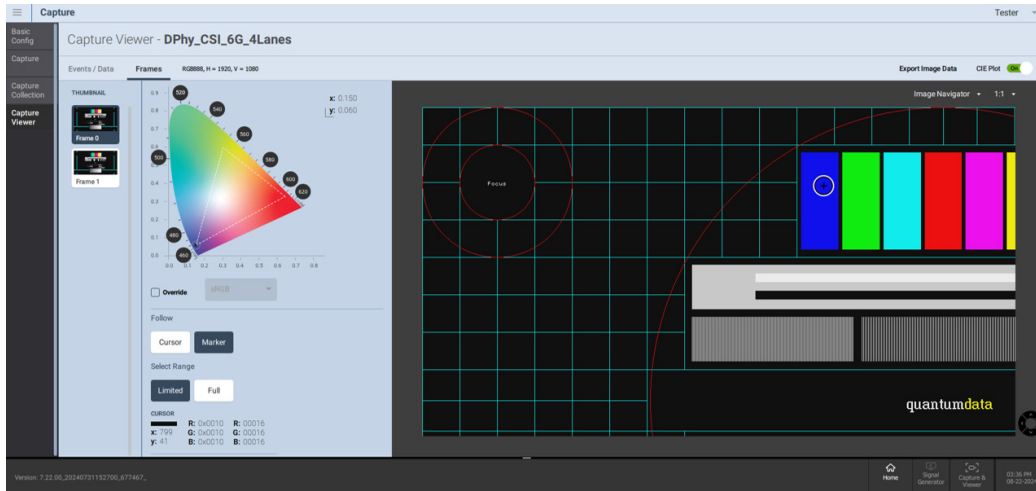
The Teledyne LeCroy CSI/DSI Protocol Suite's Capture Viewer enables you to view the captured CSI and DSI events and image frames. The Events / Data tab provides an Event Plot, which is a graphical timeline of the CSI and DSI events for each lane, and an Event Table view, which displays a sequential listing of events. The Event Plot and the Event Table are synchronized with precise timestamps provided for each event (which can be Low Power transitions, High Speed packets and bursts.) The Details window shows the decoded data for the selected event, and markers can be used to measure duration between events in the Event Plot. You can pan and zoom to view the event data, and Filter and Find functions enable you to quickly locate specific events or types of events. Capture data can be easily transferred from the Envision X14 instrument to your PC for off-line analysis.



D-Phy CSI Capture at 6Gb/s on 4 Lanes – Showing Captured Data



C-Phy DSI Capture at 1.5Gb/s on 3 Lanes – Showing Captured Data



D-Phy CSI Capture at 6Gb/s on 4 Lanes – Showing Frame View

Intelligent Capture Triggering

The Envision X14 Analyzer provides hardware triggering to ensure particular protocol events of interest are captured. Trigger events can be specified at the protocol level, targeting specific protocol structures, counts and errors. External triggers from a scope for example can also be used to initiate a capture.

Envision X14 - Generation (Exerciser)

The Generator can be programmed to all standard video and image types outlined in the MIPI CSI-2 and DSI-2 specifications. This enables you to emulate a variety of image sensors and parameters over multiple lane configurations.

Camera Emulation Mode Test Configuration

CSI Test Configuration – Camera Emulation Mode

In CSI Camera emulation mode, the X14 Exerciser acts as a MIPI CSI image Sensor/Camera connected to a CSI Host/Image Processor under test (DUT).



Host Emulation Mode Test Configuration

DSI Test Configuration – Camera Emulation Mode

In DSI Host emulation mode, the X14 Exerciser acts as a MIPI DSI Host SoC connected to a DSI Display Device under test (DUT).

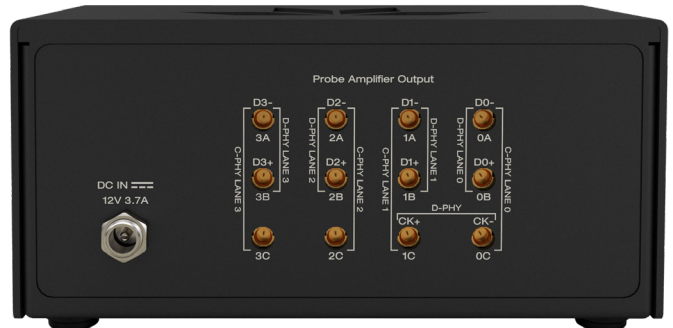


Envision X14 Solder-Down Probes

The Teledyne LeCroy solder-down probe system is comprised of a Probe Amplifier with Probe Tip Assemblies. The Envision X14 Probe system is suitable for C-Phy and D-Phy and for both CSI-2 and DSI-2 analysis.



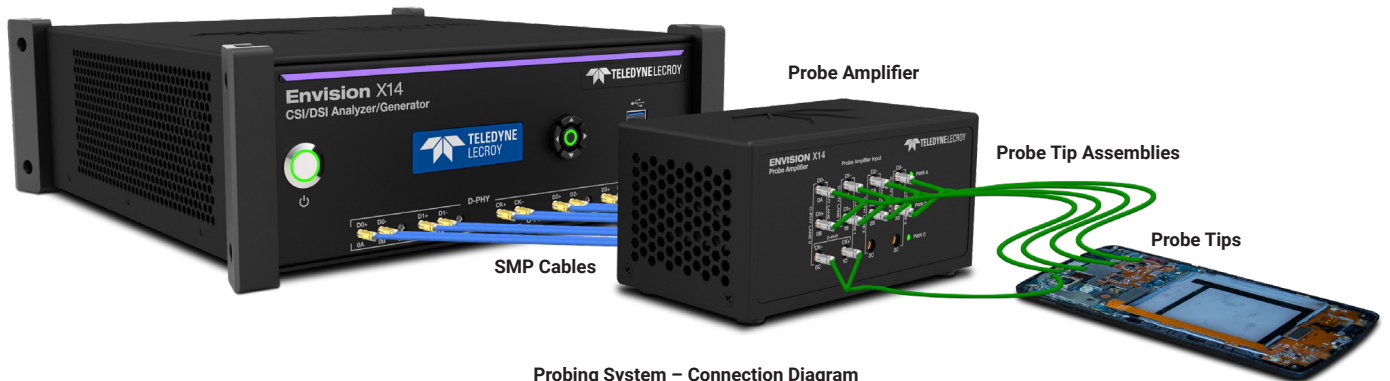
Probe Amplifier – Front View



Probe Amplifier – Rear View



Envision X14 Instrument



Probing System – Connection Diagram

Specifications

General	
Protocols Supported	MIPI CSI-2 v4.0.1, MIPI DSI-2 v2.1
Analyzer Recording Memory	16 GBytes
Generator memory for images	4 GBytes
Connectors - Front	
D-PHY & C-PHY Interconnection	(10) SMP Jacks (signal); (2) SMP jacks for D-PHY clock D-PHY (4) Lanes: D0+/- D1+/- D2+/- D3+/- CK+/- C-PHY (3) Lanes: A0 B0 C0; A1 B1 C1; A2 B2 C2
Auxiliary Connector	Future Functionality
I2C Connector	I2C Communication Bus for CSI Camera Control Interface (CCI) 400kHz
Trigger IN Connector	SMA Jack Input Impedance: 700 Kohms; Impedance: 700 Kohms; Vih: +2.0V Min., Vil: +0.8V Max
Trigger OUT Connector	SMA Jack Output Impedance: 50 ohms; Max. Input Voltage: +3.3V; Voh: +2.3V Min. @ 12mA
Envision X14 Probe System - Connectors (Front)	
D-Phy & C-Phy Interconnection	(10) SMP Jacks (signal); (2) SMP jacks for D-PHY clock
Envision X14 Probe System - Connectors (Rear)	
D-Phy & C-Phy Interconnection	(10) SMP Jacks (signal); (2) SMP jacks for D-PHY clock
Envision X14 Base System - Physical/Electric/Admin	
Dimensions (W x H x D)	Height: 3.44 in. (8.74 cm) Width: 9.57 in. (24.30 cm) Depth: 10.94 in. (27.79 cm)
Weight	7.6 LBS; 5.057 Kg
Rack mountable	2 RU mounts in 19-inch rack with rack mounting brackets
Environmental	Operating Temperature: 0°C to 50°C (32°F to 122°F) Non-Operating Temperature: -10°C to 80°C (14°F to 176°F) Humidity: 10% to 90% RH (non-condensing)
Power Requirements	External 120-220V AC Power
Regulatory	CE, RoHs 2015, CSA, UKCA
Warranty	12 Months Hardware Warranty
Envision X14 Probe System - Physical/Electric/Admin	
Dimensions (W x H x D)	Height: 2.8 in. (7.11 cm) Width: 5.4 in. (13.720 cm) Depth: 2.7 in. (6.86 cm)
Weight	0.92 LBS; 0.42 Kg
Environmental	Operating Temperature: 0°C to 50°C (32°F to 122°F) Non-Operating Temperature: -10°C to 80°C (14°F to 176°F) Humidity: 10% to 90% RH (non-condensing)
AC Adapter	100-240 VAC, 47-63Hz
Regulatory	CE, RoHs 2015, CSA, UKCA
Warranty	12 Months Hardware Warranty

Ordering Information

Product Description

Envision X14 Hardware
 Envision X14 D-PHY and C-PHY Solder Down Probes
 Envision X14 D-PHY License
 Envision X14 C-PHY License
 Envision X14 Camera Serial (CSI-2) License
 Envision X14 Display Serial (DSI-2) License
 Envision X14 Analyzer License
 Envision X14 Generator License

Product Code

ENV14-CD01-TAA-X
 ENV14-SDP01-CDPRB-X
 ENV14-CD01-DPHY-A
 ENV14-CD01-CPHY-A
 ENV14-CD01-CSI-A
 ENV14-CD01-DSI-A
 ENV14-CD01-ANA-A
 ENV14-CD01-GEN-A



Local sales offices are located throughout the world.
 Visit our website to find the most convenient location.
 1.800.909.7211 • teledynelecroy.com

